NEW CLAIMS

13.   A non-intrusive method for measuring loss rates and transfer durations for data in a telecommunication network in packet mode comprising the steps of:

performing measurement operations with a plurality of observing probes that are synchronized and distributed at different points in the network on data packets which are being transmitted through the network;

said performing step comprising dating and identifying the data packets;

transmitting measurement results from said dating and identifying step from said probes to a collecting module;

said performing step further comprising classifying the data packets in a homogeneous flow and counting the data packets in the homogeneous flow and transmitting measurement results from said classifying and counting steps from said probes to said collecting module through the network; and

performing with the collecting module a correlation between all of said measurement results received from the probes including determining unidirectional transfer durations per flow or information flow group and the loss rate for the data packets.

14. A method according to claim 13, further comprising said identifying step comprising calculating an identification signature on packet contents for each said data packet.

15. A method according to claim 13, further comprising said dating step comprising subjecting each observed data packet to dating in accordance with an absolute time reference gained by the observing probes.

16. A method according to claim 15, further comprising issuing one ticket comprising packet passage time, packet signature, and a value of a counter associated with the flow or the information flow group.

17. A method according to claim 16, further comprising a filtering step and a semi-static sampling step for classes obtained during the classifying step and said sampling step comprising selecting those data packets which will cause said one ticket to be issued.

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18. A method according to claim 17, further comprising a dynamic sampling step with a rate which depends on congestion conditions in the network.

19. A method according to claim 17, wherein said sampling step is performed with a sampling rate which can be limited to a maximum value that is defined by an initial configuration or be modulated by the collecting module or by an external device operating the network.

20. A method according to claim 18, wherein said sampling step is performed with a sampling rate which can be limited to a maximum value that is defined by an initial configuration or be modulated by the collecting module or by an external device operating the network.

21. A method according to claim 13, wherein said classifying step comprises classifying each said data packet according to recipient characteristics of the respective data packet or according to a contents type for the respective data packet.

22. A method according to claim 13, wherein for a given flow F, the transfer durations determining step is carried out as follows:

$$D_{es}(p) = Hs(p) - He(p)$$

where $D_{es}(p)$ is a transfer duration from an entry point (e) to an exit point (s) for a respective data packet (p); He(p) is a first time stamping in a ticket associated with the respective data packet (p) by one of said probes at the entry point; and Hs(p) is a second time stamping in the ticket associated with the respective data packet (p) by said one of said probes at the exit point.

23. A method according to claim 13, further comprising calculating the transfer durations at different sections in the network using a mapping operation of combinations which belong to one of said data packets that has been observed by several of said probes.

24. A method according to claim 13, wherein, for a given flow, the loss rate determining step comprises calculating a number Pes(pq) of said data packets lost in the network between a passage of two data packets designated p and q according to the following formula:

$$Pes(pq) = Ne(pq) - Ns(pq)$$

where Ne(pq) = number of data packets between the passage of the packets p and q at an exit point; and Ns(pq) = number of packets between the passage of the packets p and q at an entry point.

25. A method according to claim 19, wherein, in the case where the sampling rate is low, breaking down time in slots starting from an instant when an observed data packet causes one last ticket to be issued, fixing the size of each time slot locally at one of the probes or by the collecting module, associating one counter with each time slot, and, for every data packet passing by that does not cause one ticket to be issued, incrementing said one counter associated with a corresponding time slot when the passage occurred, and for the next packet passing by that causes one ticket to be issued, attaching a list of counters thereby obtained.

26. A system with a distributed architecture for measuring non-intrusively loss rates and transfer durations for data in a telecommunication network in a packet mode, said system comprising:

a plurality of flow observing probes arranged in several locations in the network;

means for transmitting measurements from said probes to a collecting module including means for analyzing said measurements;

each of said probes further comprising means for classifying data packets in a homogeneous flow, means for identifying each said data packet, means for counting the data packets in one flow;

said transmitting means using the network to transmit the measurements carried out by the probes to the collecting module; and

the collecting module comprising means for determining unidirectional transfer durations per flow or information flow group and the loss rate for the data packets.

27. A system according to claim 26, wherein the identifying means of each said probe comprises means for calculating an identification for each said data packet.

28. A system according to claim 26, wherein each said probe further comprises means for compressing the measurements before transmitting said measurements to the collecting module.